MUSKMELONS are grown commercially and for home use over a wide range of territory in the United States. The essentials for the production of good melons are a relatively long growing season and plenty of soil moisture and bright sunshine during the growing period. The crop can be grown on almost any well-drained, fertile soil but does best on rich sandy loam and on medium to light alluvial soils.

Muskmelons are subject to diseases that affect both the yield and the quality of the fruit. Losses from disease can be avoided or reduced by crop rotation, chemical treatment of the seed, and effective application of sprays or dusts. For certain diseases the use of resistant varieties is a means of control.

Muskmelons attain their highest flavor and quality only when produced on disease-free vines and allowed to become practically ripe before being harvested. The industry has been severely injured through marketing of unripe melons. With present-day refrigeration, melons harvested when fairly mature can be shipped long distances and still be marketed in satisfactory condition.

Production of melons for commercial shipment is a highly specialized industry. Successful results are obtained only when careful attention is given to all details. In order to satisfy the consuming public, every grower and shipper should make it his aim to place upon the table of the consumer the type and quality of melon he would want on his own table.

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MUSKMELONS

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Contents

CLIMATE AND SOIL

THE MUSKMELON originated in the hot valleys of Iran (Persia) and prefers a hot, dry climate like that of Iran. During the early stages of growth the plants need warm weather, ample soil moisture, and a dry atmosphere. Excessive moisture while the melons are ripening is likely to lower their quality. The principal commercial varieties of muskmelon grown in the United States require about 80 to 115 days from the time the seed is planted until the first melons are ripe. For maximum yields a growing season of from 130 to 140 days, having a rather high mean temperature, is desirable. Some varieties are often grown successfully in certain of the Northern States where the growing season is as short as 120 days.

The poor quality of many commercial muskmelons, particularly among those produced in humid parts of the country, is due mainly to disease and too early harvesting. Leaf diseases such as downy mildew and anthracnose damage or kill the plants. Melons apparently of full maturity that are taken from severely diseased or dying vines seldom have good eating quality. Melons picked before they have reached a suitable stage of maturity, even on healthy vines, never develop good eating quality. Growers have often severely damaged a large potential market for muskmelons by marketing melons that were too immature or that were harvested from disease-damaged plants.

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Muskmelons can be grown with some success under many different kinds of climatic conditions. This is proved by the fact that they are produced as a commercial crop in 26 of the United States, and as a home-garden crop in many additional States.

Climatic conditions highly favorable to the muskmelon plant are found in the Imperial Valley of California, the Rocky Ford district of Colorado, and other irrigated districts, and to a limited extent in the Eastern, Central, and Southern States.

Muskmelons generally do best on well-drained, warm sandy loam or silt loam soils. Some fine melons come from sandy river bottoms and from areas of rich clay loam. The commercial crops of Colorado, Arkansas, Texas, Michigan, New Jersey, South Carolina, and southern Georgia are largely the product of sandy loams; those of Indiana and other North Central States are for the most part grown on sandy loams or light clay loams. The large commercial crop of the Imperial Valley of California is grown mainly on what is known as the Holtville silty clay loam. Warmth, good drainage, an abundance of available plant food, and plenty of humus are the chief requirements of a soil on which to grow muskmelons. The plants will not endure an overflow, and no attempt should be made to grow this crop where water would stand in furrows for extended periods after a rain or the soil washes badly. Any good garden soil may be used to grow muskmelons for home use in localities where length of season and other features of climate are right.

ROTATION

Crop rotation helps to hold down muskmelon diseases and to keep the soil in productive condition both as to plant food elements and as to texture. A rotation in which neither muskmelon nor any of the other cucurbits (cucumber, melons, squash, and pumpkin) is planted oftener than once in 3 years is recommended. The crops used in the rotation should not include crops that are subject to the same diseases as muskmelon. For example, in sections where root knot is prevalent cucumbers, tomatoes, and other susceptible crops should never be planted in the rotation with muskmelons.

What crops should be used in the rotation depends partly upon the locality. In the West, muskmelons yield best when grown after alfalfa, and where alfalfa land is not available they should follow legumes or other annual cover crops. In the East, the best results are obtained on clover or alfalfa sod or on land that has been enriched by turning under annual legumes grown as cover crops. In market-garden districts where alfalfa and clover are not grown extensively it is good practice to plant muskmelons on land that has previously been in potatoes or sweetpotatoes and then in a cover crop.

VARIETIES AND STRAINS

Muskmelons grown for shipment are mainly of the smaller, nearly round to definitely oblong, heavily netted sorts, whether pink-, green-, or salmon-fleshed. This type has become popular because of (1) its carrying qualities, due to its having a heavy protective netting and firm flesh; (2) sizes and shapes adapted to marketing requirements; and (3) superior quality, when the melons are properly ripened on

the vine. A second popular group of shipping muskmelons includes the Casaba, Honey Dew, and others of the semikeeping or winter types. Several varieties suitable for shipping are grown mainly for home use and local marketing.

Special strains of muskmelons arise from cross-pollinations, either intentional or accidental, and selection. Many of these strains soon disappear, but some have become outstanding commercial varieties. In recent years much attention has been given to breeding for disease resistance. Examples of valuable muskmelon varieties that have resulted from this type of work are Powdery Mildew Resistant Nos. 5 and 6.

Fine varieties of muskmelon are so numerous that any attempt at a complete listing here would be impractical. Brief descriptions are given of the varieties now most in demand for commercial and home-garden planting. Strains that have shown merit but have not been tested in more than one locality are omitted. The varieties have been grouped in two classes—those grown chiefly in the Eastern and Central States, but not strictly limited to these regions, and those grown chiefly in the West. The descriptions indicate, as far as the information is available, the main geographical distribution of the varieties and their suitability for shipping, local marketing, or home gardens.

VARIETIES GROWN COMMONLY IN HUMID AREAS AND GROWN ALSO IN IRRIGATED AREAS

Banana.—Fruit long and shaped somewhat like a banana, about 20 by 4 inches, with lemon-colored skin when ripe. Flesh a pronounced salmon color. Time from seeding to the first ripe fruits about 95 days. Semikeeping variety grown chiefly in home gardens in the South.

Bender Surprise.—Fruit slightly oblong with full rounded ends, about 8 by 7½ inches. Typical fruit has distinct ribbing, coarse netting, and hard rind, and is grayish yellow at maturity. Flesh a bright salmon color and of high quality. Time from seeding to the first ripe fruits about 94 days. Variety not recommended for long-distance shipping. Frequently grown in the Northeast and Middle West.

Burrell Gem (Defender).—Fruit oval, distinctly elongated, about 6 to 8 by 4½ to 5½ inches, tapering slightly at ends. Well-marked sutures between ribs. Rind well-netted and tough. Flesh thick, salmon-colored, fine-grained, spicy, and sweet. Time from seeding to the first ripe fruits about 95 days. Fruit excellent for shipping. Variety very well adapted for growing in the West and Southwest where irrigation is practiced.

Emerald Gem.—Fruit practically round, about 5 to 6 inches in diameter, weighing 2 to 3 pounds. Typical specimens (fig. 1) irregularly ribbed, with little netting, and green. Flesh very thick, of fine texture, deep salmon color, high aroma, and excellent quality. Time from seeding to the first ripe fruits about 85 days. Variety generally well adapted for home gardens and local marketing, but not for shipping.

Golden Gopher.—Fruit usually about 6½ by 6 inches. Normal specimens deeply ribbed, with some gray netting, and bluish gray. Flesh extremely bright orange. Time from seeding to the first ripe fruits about 85 days. Variety developed by Minnesota Agricultural Experiment Station and grown mainly in Minnesota. Resistant to fusarium wilt. Not adapted to long-distance shipping.

Hackensack.—Two well-defined strains, extra early and large late. Fruit of extra-early strain somewhat flattened at the ends, usually about 6 by 5 inches, with distinct ribs and netting. Fruit of large late strain about 9½ by 6½ inches, strongly ribbed, and coarsely netted. Flesh of both strains green, medium thick, medium- to coarse-textured, juicy, and sweet. Time from seeding to the first ripe fruits about 94 days. Usually grown only for local markets and in home gardens. Can be grown in most of the muskmelon-producing States.

FIGURE 1.—Emerald Gem muskmelon.

Hale Best (original strain).—Fruit oval, about 7 by 6 inches, with faint ribbing and heavy netting (fig. 2). Flesh very thick, salmon orange in color, very sweet, and of fine quality. Strain very extensively planted in North, East, and West. Time from seeding to the first ripe fruits about 85 days. Strain not resistant to powdery mildew and unadapted to sections of the Southwest where this disease prevails, but otherwise suitable for culture in most parts of the United States. Size of fruit somewhat larger than is most desired in many markets.

Hale Best No. 36.—Fruit smaller than that of original strain, weighing 3 to 4 pounds. Very uniform in size, without ribbing but solidly netted. Flesh thick, fine-grained, salmon-colored, and of good quality. Time from seeding to the first ripe fruits about 83 days. Good strain for shipping and for home gardens throughout the United States except where powdery mildew is common in the Southwest.

Hale Best No. 112.—Characteristic about the same as those of Hale Best No. 36, but fruit more nearly round.

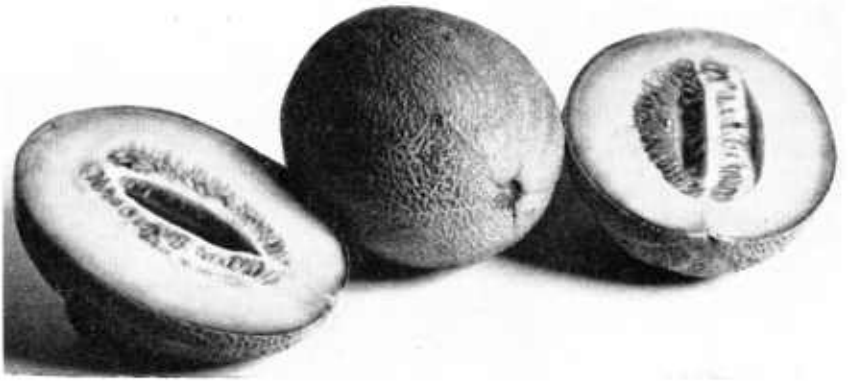

FIGURE 2.—Hale Best muskmelon of original strain.

Hale Best No. 936.—Fruit larger than that of No. 36, about 6¼ by 5¾ inches. Similar to fruits of other Hale Best strains in quality and general appearance, well adapted for early market and for roadside stands except in sections where powdery mildew prevails.

Hearts of Gold (Improved Hoodoo).—Fruit round, usually about 5½ inches across, with shallow ribbing and heavy netting. Flesh thick, deep golden, firm, and of high quality. Time from seeding to the first ripe fruits about 94 days. An excellent melon for local markets and shipment for moderate distances. Grown in most of the muskmelon-producing States, except where powdery mildew is common.

Honey Rock.—Fruit practically round, 5 to 6 inches across, with coarsely netted, tough rind. Flesh medium thick, salmon-colored, and of high quality. Time from seeding to the first ripe fruits about 85 days. Variety grown extensively in North Central States. Excellent for home gardens and for roadside markets, and can be shipped moderate distances.

Improved Perfecto.—Fruit slightly oval, about 5½ by 5 inches, with slight ribbing and solid netting. Flesh very thick, fine-grained, and orange-colored. Time from seeding to the first ripe fruits about 90 to 95 days. Used chiefly for shipping. Can be grown in all the muskmelon-producing States, except where powdery mildew is common.

Iroquois.—Fruit round or slightly oval, about 6½ inches in diameter, with prominent ribbing and well-netted, hard rind. Flesh of deep orange color, fine texture, and excellent quality. Variety developed by New York (Cornell) Agricultural Experiment Station. Of considerable interest because of high quality and resistance to fusarium wilt. Time from seeding to the first ripe fruits about 90 days. Now being grown in the Northeastern States and probably has a wider adaptation.

Milwaukee Market.—Fruit slightly flattened at ends, about 7 by 6½ inches, with prominent ribbing, coarse netting, and hard rind. Flesh extremely thick, deep pink. Time from seeding to the first ripe fruits about 85 days. Variety a heavy yielder. Best adapted for home gardens and for local marketing, seldom used for long-distance shipping. Most popular in North Central States, particularly Wisconsin.

Osage (Miller's Cream).—Two strains recognized—Osage and Extra Early Osage. Osage fruit about 7 by 6½ inches, with indistinct ribbing and a trace of netting. Extra Early Osage fruit smaller. Skin dark green at immature stage, changing to mottled orange and green. Flesh thick, of rich salmon color and excellent quality. Time from seeding to the first ripe fruits about 92 days for Osage, somewhat less for Extra Early Osage. Variety excellent for home gardens and for local marketing. Decidedly popular in the Great Lakes region.

Powdery Mildew Resistant No. 45.—Resistant to race 1 but not to race 2 of powdery mildew. Fruit oval, about 6¼ by 5½ inches, with indistinct ribbing and heavy netting. Flesh thick, light orange, and closely similar to that of Hale Best (one of the parents of this variety). Texture firm, quality sweet and otherwise excellent. Time from seeding to the first ripe fruits about 85 days. Bred for use in the Southwest where powdery mildew is serious. In locations where it is adapted, variety excellent for shipping, resembling Hale Best. Not resistant to alternaria leaf blight, anthracnose, mosaic, or downy mildew, diseases common in the East. Grown chiefly in the Imperial Valley.

Powdery Mildew Resistant No. 5 and No. 6.—Similar to Powdery Mildew Resistant No. 45, but resistant to both race 1 and race 2 of powdery mildew. Not resistant to other diseases of muskmelons. Time from seeding to the first ripe fruits about 87 days. Very important commercial strains in Imperial Valley, where both races of mildew are prevalent.

Pride of Wisconsin (Queen of Colorado).—Fruit slightly oblong, about 6½ by 6 inches, heavily netted, with hard rind. Ripens to a yellowish shade. Flesh very thick, orange-colored. Seed cavity small. Time from seeding to the first ripe fruits about 90 days. Melon of excellent quality, capable of withstanding shipping for moderate distances. Grown mainly in North Central States.

Purdue No. 44.—A variety of Hale Best type, developed by the Agricultural Experiment Station of Purdue University. Resistant to alternaria leaf blight but not to other diseases. Has exhibited yielding qualities superior to those of

other varieties of its type. Fruit slightly oval, of medium size, and well-netted. Flesh thick, salmon-colored, and of good quality. Time from seeding to the first ripe fruits about 85 days. Well adapted to shipping.

Rocky Ford (Netted Gem).—Gem type, not a distinct variety, developed in Rocky Ford district of Colorado. Typical strains have small fruit (fig. 3) about 5½ by 5 inches with faint ribbing, hard gray netting, fairly large seed cavity, and green spicy flesh. Time from seeding to the first ripe fruits about 92 days. Commonly grown in both home and market gardens. Popularity due very largely to spicy flavor.

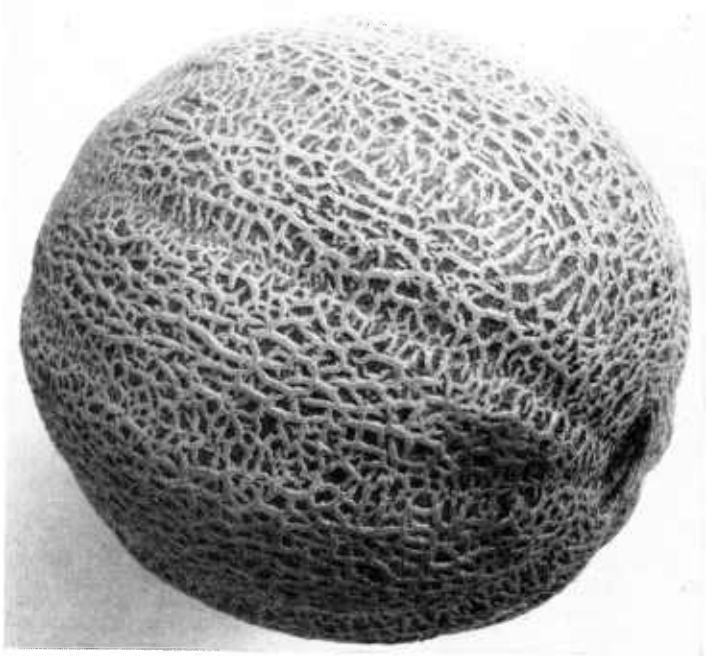

FIGURE 3.—Rocky Ford (Netted Gem) muskmelon.

Schoon Hard-shell or New Yorker.—Fruit oblong, about 8 by 7 inches, weighing 6 to 7 pounds. Deeply ribbed and, except on the distinct sutures, covered with hard, grayish, ropelike netting. At ripe stage, rind a beautiful golden yellow. Flesh thick, medium-grained, salmon red, and of excellent flavor. Time from seeding to the first ripe fruits about 90 days. Because of hard rind and good quality, variety is well suited for shipping and home gardens. It has a wide geographical adaptation.

Sweet Air (Knight).—Fruit (fig. 4) oblong, about 5½ by 4½ inches, weighing about 2 pounds. Fruit ribbed, heavily netted, and deep green, ripening to golden yellow. Flesh green shading to pink at center, very juicy. Time from seeding to the first ripe fruits about 87 days. Variety grown extensively in tidewater sections of Virginia, Delaware, and Maryland for local marketing.

Texas Resistant No. 1.—Strain showing marked resistance to downy mildew and to aphids. Developed at Winter Haven substation of Texas Agricultural Experiment Station by cross-breeding varieties including Hale Best and one from the West Indies that showed great resistance to downy mildew. Fruit oblong, 5 to 6 by 4½ to 5½ inches, with characteristics and quality of Hale Best strains. Time from seeding to the first ripe fruits about 85 days. Not extensively used.

Tiptop.—Fruit oblong, about 7 by 6½ inches, indistinctly ribbed and moderately netted. Flesh thick, of a rich salmon color. Time from seeding to the first ripe fruits about 90 days. Old, very popular variety extensively grown for home use and local marketing, especially in the East.

Crenshaw.—Fruit usually somewhat pear-shaped, 7 inches long by 6 inches across at the largest diameter, skin rough or slightly corrugated, dark green when immature, yellow when ripe. Flesh salmon pink, thick, of distinctive flavor and excellent quality. Time from seeding to the first ripe fruits 110 days. Adapted for growing under irrigation in districts in the West and Southwest where powdery mildew is not severe.

Golden Beauty (Casaba).—Fruit slightly oblong, about 8 by 7 inches, weighing 6 to 10 pounds, without netting. Rind golden yellow, furrowed lengthwise of melon. Flesh solid white, fine-grained, sweet but without aroma. Subtropical in origin, in this country the Golden Beauty approaches perfection only in warm parts of the Southwest and West. Time from seeding to the first ripe fruits about 105 days. Fruit, if properly stored, keeps for months. Not resistant to powdery mildew.

Honey Ball.—Fruit round, about 5 inches across, nearly smooth with sparse, coarse netting, and yellowish white. Flesh gray green (pink in one strain) and juicy, with sweet, spicy flavor. Variety said to be a cross between Texas Cannon Ball and Honey Dew. Time from seeding to the first ripe fruits usually about 105 days. Classified as a shipping melon and keeps well for limited periods.

Honey Dew.—Fruit somewhat oblong, usually about 7 by 6 inches, often variable in size and shape. Typical weight about 6 pounds. Rind smooth, greenish white turning to creamy yellow at ripe stage. Flesh thick, greenish, fine-grained, and of good quality when melons are properly grown, ripened, and handled. Time from seeding to the first ripe fruits about 115 days. Variety requires a hot climate, does best under semiarid conditions with irrigation. No strain particularly successful in Eastern or Southern States.

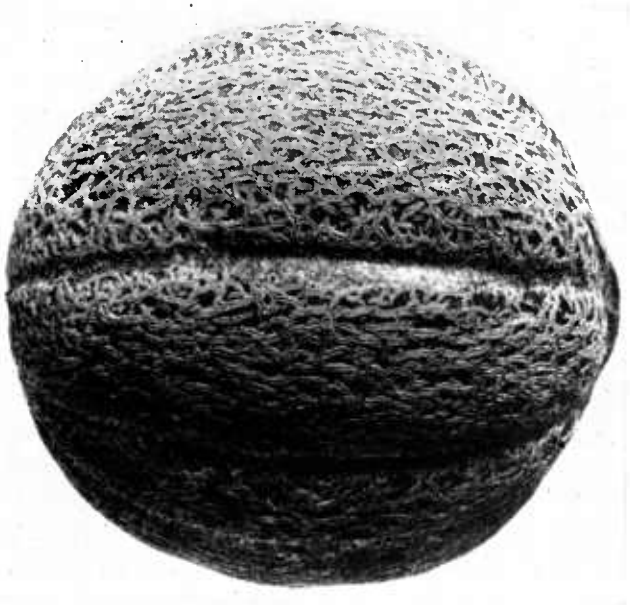

FIGURE 4.—Sweet Air (Knight) muskmelon.

Persian.—Fruit practically round, usually about 7½ inches across, with average weight of about 7 pounds. Rind dark and completely covered with fine netting. Flesh very thick, pink, and of excellent quality. Time from seeding to the first ripe fruits about 115 days. Variety requires a high-temperature growing season. Grown principally in the Southwest for shipping.

Santa Claus.—Fruit (fig. 5) oblong, about 12 by 6 inches, weighing about 6 pounds. Rind green and gold, usually with a trace of netting. Flesh light green and of typical Casaba flavor. Principal use for local western markets. Fruit may be kept in storage for extended periods, sometimes until midwinter. Time from seeding to the first ripe fruits about 110 days.

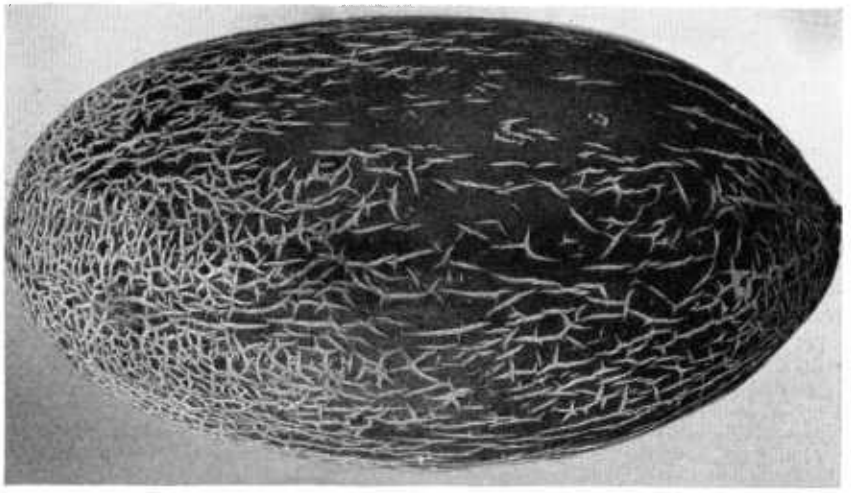

FIGURE 5.—Santa Claus muskmelon.

SEED SUPPLIES

The first essential to growing a profitable crop of muskmelons is using seed that is true to type, uniform, and of high vitality. Improvement of muskmelon varieties through breeding and selection has been carried so far that ample supplies of high-grade seed from selected stock can now be obtained from dealers. Great quantities of seed are produced within a limited area near Rocky Ford, Colo. The growth of muskmelon seed production in the Rocky Ford section has resulted largely from the demand of melon growers' associations for seed of pure strains, especially of types suited for long-distance shipment. The Rocky Ford section has a climate especially favorable for growing melons of high quality that are fairly free from disease.

Although there is no foundation for the belief held by some farmers that muskmelons cross with cucumbers, pumpkins, or squashes, different varieties of muskmelon do cross with each other. Anyone growing the seed must take care to prevent this; in fact, only one variety of muskmelon should be grown for seed in any one field or in any one neighborhood.

When muskmelon plants are being grown for the purpose of producing seed they are carefully examined from time to time and any found to be weak, diseased, or not true to type are removed. Melons to be used for seed production are selected on plants that are high-yielding, disease-free, and true to type. After becoming fully ripe, they are gathered into piles. These melons may be cut in the field, and the seed collected first in pails and then in barrels on a truck and hauled to a central plant. There, the seed and the pulp surrounding them are allowed to stand in the barrels for a few hours until, as a

result of fermentation, the pulp floats to the surface of the juice and the seed settle to the bottom. The pulp is then poured off. Another method is to use a separating machine, which is either driven directly to the field or used at a central point. The separated seed are washed with plenty of clean cold water. A special machine has been developed for washing large quantities of muskmelon seed. After being washed, the seed are spread thinly on trays having screen-wire or burlap bottoms and are placed in the sun to dry. During the drying process they are frequently stirred, to make sure that they will dry quickly and evenly. When thoroughly dry they are bagged and stored in a well-ventilated, dry room where they have protection from mice, rats, and other pests.

For saving small quantities of seed the usual method is to select uniform melons of the desired size and type on vigorous, disease-free, high-yielding vines just before the crop is harvested and mark each of the selected melons by tying a piece of string around the stem. After the seed melons have become thoroughly ripe on the vines they are removed and are kept for 2 or 3 days so that the pulp surrounding the seed will soften. Then each of them is cut in halves, and the seed are removed to a container such as a wooden pail, barrel, or tub—or, if the quantity of seed is very small, a glass or stoneware jar. The seed are left in their own juice, without addition of water, until the juice ferments slightly, and then are washed clean and dried.

Growers who save their own supplies of seed provide 2 pounds for each acre to be planted. This quantity includes seed to be used in replanting if it becomes necessary.

Commercial muskmelon growers, especially those who belong to associations, arrange for their seed supplies long before planting time. Usually they buy their seed through association managers. In each locality, long experience has shown what variety and strain give best results and the commercial crop should always be planted from seed of a proved variety and strain.

PREPARING AND FERTILIZING THE SOIL

To prepare a field for successful muskmelon growing the farmer must plow it carefully and deeply, early enough to let the soil settle thoroughly before planting time. Land that is in sod or on which a cover crop precedes the muskmelons should be plowed in the fall or the winter, so that the plant material turned under may decay sufficiently before the planting.

Under normal conditions there is no advantage in bedding well-drained sandy loam soils for growing muskmelons, but on low river-bottom or alluvial soils bedding is necessary. The beds should be made 5 to 7 feet wide, and one row should be planted on each bed. In parts of the Atlantic and Gulf regions where excessive rains frequently occur during early summer it is desirable to plow the land in 5- or 6-foot beds, with open furrows between to give better drainage. In the North Central States the land is plowed in the usual manner and the melons are planted on the level or on slight mounds, or hills. Where the crop is grown under irrigation the land is bedded in conformity with local irrigation practices. In western irrigated sections

raised beds are always used, in order that the vines and melons may be above water level during irrigation. These beds usually run east and west, are 6 to 8 feet apart on centers, and are separated by rather deep irrigation furrows made by backfurrowing with a turnplow.

On rolling land or where there is danger of excessive erosion, beds and rows are often laid out on the contours. This arrangement is especially desirable in localities where drought is likely to occur, as it prevents rapid runoff and conserves moisture for later use of the plants.

An excellent plan followed by many California growers is to have field roads about 400 feet apart at right angles to the rows. Another plan is to leave a space between rows, every seventh to tenth row, wide enough for operating spray outfits and trucks.

After being plowed, the soil should be thoroughly cut with a disk harrow. Just before the planting, it should be gone over with a smoothing harrow. The type of harrow that crushes, turns, and pulverizes the soil in one operation is an excellent tool for this final preparation. On extremely loose or sandy soils an ordinary spike-tooth smoothing harrow will do the work. In western irrigated sections, the soil at the surface of each bed is harrowed smooth to form a soil mulch, a V-shaped furrow for seeding is run along the south edge of each bed (where the young plants will receive the full effect of sun and be protected from north winds), and a moderate stream is run down the irrigation furrow to establish suitable moisture conditions.

Muskmelon plants grow fast and need an abundance of plant nutrients. If stable or feed-lot manure is used in the hills or beds it should be well decayed. In using manure it is a good plan to add 100 pounds of superphosphate (acid phosphate) to each ton and apply 6 to 10 tons of manure per acre. The manure should be broadcast and worked into the soil. Where a manure spreader is available it can be driven astride the bed and the manure applied to a strip about 4 feet wide along the center of the bed. On land that is not bedded the rows may be laid off and the manure applied with the spreader in the strips where rows are to be located.

Another method is to lay off rows with a turnplow or a middlebuster, apply the manure within the furrows in small piles correctly spaced for hills, then use the turnplow or middlebuster again to form a slight bed over the manure. In some cases lines are first marked on the land to indicate the distance between hills, furrows are opened at right angles to these lines, and the manure is placed in the furrows at the intersections. If the manure available does not amount to more than 4 tons per acre, best results will usually be obtained by applying it in the hills. Poultry and sheep manures are sometimes used in the hills. As both are highly concentrated, they should be used sparingly and should be thoroughly mixed with the soil.

Commercial fertilizers are almost always necessary for growing muskmelons on a large scale. The kind and quantity of fertilizer that should be used depend upon the character of the soil and the way the land has been cropped. As a rule, it is profitable to apply 800 to 1,200 pounds per acre of a fertilizer containing 4 to 5 percent nitrogen, 8 to 10 percent phosphoric acid, and 4 to 6 percent potash. Some of the rare mineral elements, also, may be required. On soils that have been highly fertilized the previous season or have been used to grow

alfalfa or a heavy crop of velvetbeans, cowpeas, or clover, 600 pounds will usually be enough. Where manure has not been applied and legumes have not been grown recently, at least 800 pounds of a complete fertilizer should be used; elsewhere, a little less nitrogen may be needed. Some of the more efficient melon growers in Maryland, Delaware, and New Jersey apply 600 pounds of fertilizer per acre, either broadcast or in a strip 2 to 4 feet wide along each row, when they are preparing the land, and during the growing season follow this with two side dressings of 200 to 300 pounds per acre each. The first side dressing is drilled about a foot from the plants when the vines begin to run; the second is applied at the time of the last cultivation, when the vines have to be turned in order to apply the fertilizer.

Many growers, in addition to making the usual broadcast application, scatter a small handful of fertilizer where each hill is to be made. Some small growers also place about a teaspoonful of nitrate of soda in each hill, 3 or 4 inches from the young plants, shortly after the plants come through the ground, to give them a quick start and get them beyond the tender stage.

METHODS OF PLANTING

Muskmelon seed is usually planted in the field, in hills or drills. Occasionally the plants are started in greenhouses, hotbeds, or sash-covered frames and transferred to the field when weather conditions become favorable. The second method is suitable for small acreages, especially in market-garden sections where land values are high and growers want some of their melons to mature very early. Starting muskmelon plants under cover with artificial heating can cause some of the melons to ripen 1 to 2 weeks earlier—and lengthen by that much the period when ripe melons are available for use.

FIELD SEEDING METHODS

Field methods for planting muskmelon seed vary according to locality and climate. In western irrigated sections the seed is planted in hills 3 to 5 feet apart, slightly above water level, in the furrow along the south edge of each bed. For very early harvest the hills are covered with transparent paper for protection.

In many sections of the country muskmelons are planted in hills checked 4 to 6 feet apart in rows 7 feet apart, in order that the plants may be cultivated in both directions during the early part of the season and may continue to be cultivated in one direction after the vines have matted. Sometimes every sixth or seventh middle is made wider than the others, to serve as a roadway for the spray outfit and for trucks at harvest. In some sections—particularly in the Southeast, where contour planting is commonly practiced—the seed is usually planted in continuous rows on the contours.

Number of hills per acre varies with spacing about as follows: 5 by 5 feet, 1,740; 5 by 6 feet, 1,452; 5 by 7 feet, 1,240; 5 by 8 feet, 1,090. The most common spacing, probably, is 5 by 7 feet.

A pound of muskmelon seed is sufficient for planting an acre, although many growers provide 2 pounds. A pound contains about 13,600 of the average-sized seeds; an ounce, about 850. With 5- by 7-foot spacing, a pound of seed per acre means about 10 seeds for each hill.

In the West, where muskmelons are grown on large acreages, the seeding is generally done with tractor-drawn gang planters each of which plants four rows at once. In the East, most commonly, single-row planters are used or the planting is done by hand with an ordinary hoe, the depth depending upon the character of the soil and its moisture content. On irrigated lands or on soils that contain plenty of moisture the depth of seeding should not exceed 1 inch, and on light sandy soils it should not exceed 1½ inches.

Nothing is to be gained by planting before the soil is warm enough. Where the hills are to be covered with plant protectors, the seed can safely be planted a little earlier than on areas in the same locality where no covers will be used.

HOTBED AND GREENHOUSE METHODS

Hotbeds used for starting muskmelon plants are often heated with manure. Because of the manure shortage, many growers now use flue-heated hotbeds. The flues are usually constructed with furnaces capable of burning refuse wood, coal, or oil. In some cases, beds are heated with electricity. Since melon plants are started only after moderate weather arrives, not much artificial heating is required. About 8 inches of manure is sufficient.

Manure-heated and electric-heated beds for muskmelon plants usually are 6 feet wide and have standard 3- by 6-foot sash covers.

Details of hotbed construction are given in Farmers' Bulletin 1743, Hotbeds and Coldframes.

Containers frequently used for starting muskmelon plants in hotbeds include, among others, thin wood bands, paper plant bands, and quart berry boxes. Bands 4 x 4 x 3 inches made of wood veneer hold their shape better than those made of paper. Sometimes rich loam is spread evenly over the bed to a depth of about 4 inches and slightly firmed, the surface of the layer of loam is marked into squares of about 5 inches, and seven or eight seeds are planted in each square.

Growing muskmelon plants in hotbeds or greenhouses requires careful attention to temperature, watering, ventilating, and thinning. A temperature of 70° to 75° F. should be maintained until the seeds germinate. After that, a day temperature of 65° to 70° and a night temperature of 60° to 65° are about right. Plenty of ventilation should be given, to keep the plants short and stocky. When the plants are about ready to be set out the covers should be left off the beds most of the time, to harden the plants to outdoor conditions. A greenhouse is not a good place to start melon plants unless it can be ventilated freely and the temperature otherwise controlled.

Four to five weeks is the limit for keeping muskmelon plants in a hotbed or greenhouse, and the time for sowing the seed should be carefully determined with reference to the average date of last spring frost for the locality. Nothing is to be gained by seeding too early, and it is much better to have young and thrifty rather than overgrown or overaged plants for setting out. The plants should be thinned to three or four in a hill as soon as they come up.

A warm, calm day should be selected for shifting plants from hotbed or greenhouse to the field. The beds should be watered several hours in advance and the foliage allowed to dry. Where plants have been started in a layer of loam marked into squares rather than in

containers, a knife is run between the hills, after the watering, and the blocks of soil thus cut apart are lifted with a square-pointed trowel. As plants are lifted they are placed on boards or in trays and loaded into a cart or truck to be hauled to the field. The land should have been prepared as already described and marked in one direction. Furrows in which to set the plants should be opened only as needed. In setting, it is customary to place the hills just a little below the general level of the ground, for protection. Later, soil is filled in around the plants.

CARE OF THE GROWING PLANTS

THINNING

Muskmelons planted in the field by the ordinary methods may require careful thinning, as the number of seeds planted is much larger than the number of plants desired. When a true leaf has appeared between the seed leaves, the plants should be thinned, if necessary, to four in a hill. A final thinning leaves two plants per hill, or, in continuous-row plantings, one plant every 2 to 3 feet in the row. Where cucumber beetles are especially troublesome the final thinning is usually delayed until the plants are well established and each has three or four true leaves.

Where plants are crowded closely together in a hill, the first thinning should separate them as much as possible. If there is danger of disturbing the roots of plants that are to be left to grow, plants that are removed should be cut off rather than pulled out.

After hotbed or greenhouse plants become established in the field, they should be thinned to two in a hill. Hills where less than two have survived may be replanted with extra plants grown for that purpose.

CULTIVATION

Cultivation of muskmelons should begin as soon as the rows of plants can be followed, and the soil should be kept loose, mellow, and free from weeds until the vines have spread too far to permit further working. It should be borne in mind that the muskmelon is a rather shallow-rooted plant and that its roots often extend farther horizontally than the vines. For these reasons cultivation must be shallow, especially near the hills and after the vines begin to run freely. Where the hills are carefully checked cultivation can be given both between and across the rows during the early part of the season by means of a weeder or any shallow-working cultivator. Many growers work near the rows with a walking cultivator or with a riding cultivator or tractor-cultivator and then work the middles with a harrow. When the plants begin to spread, cultivation across the rows should stop and the vines should be kept trained in more or less compact rows. During the last cultivation, sometimes, the vines are turned back by hand or a vine-lifting attachment is used on the cultivator to permit working closer to the plants. At this time the second side dressing of fertilizer, if any, is applied and worked into the soil. After the last cultivation the tips of the vines should be spread evenly in all directions and the growth allowed to cover the entire space between rows.

Hand hoeing is required early in the season while the plants are small and at intervals after the vines have begun to develop, to remove weeds that cannot be destroyed by horse or tractor cultivation.

NIPPING AND PRUNING

Frequently growers ask whether they should nip or prune muskmelon vines in order to increase the set of fruit or hasten the development of fruit. Early American writers on muskmelon culture gave detailed instructions for nipping the vines. Evidently this advice was based on European practices in growing the crop under glass or on very small areas. The theory was that nipping the main vine hastened formation of the laterals that bear the crown setting or first fruits. Tests made by the Illinois and New Hampshire Agricultural Experiment Stations have shown that little if anything is to be gained by nipping or pruning muskmelon vines grown outdoors, under ordinary conditions. Reducing the number of muskmelons on a vine will increase the size to which the remaining melons can grow. However, muskmelon vines of most varieties produce some melons too large for a standard pack even without nipping or pruning; so these operations may bring about loss rather than gain.

POLLINATION

Inexperienced growers frequently ask why the earliest blossoms on their muskmelon vines do not set fruit. Muskmelon blossoms are of two kinds. The first to appear have stamens, the pollen-bearing parts, but not pistils, the female parts. Later come the flowers that bear pistils and produce fruits. Small undeveloped melons form at the bases of the pistillate blossoms even before the blossoms open. The melons can develop only if pollen is transferred to the pistils of these flowers by bees or other means. In most varieties the flowers that produce the fruit have not only pistils but also stamens. Where melons are grown in greenhouses or in closed frames, bees must be allowed to enter or else pistillate flowers must be pollinated by hand.

FIGURE 6.—Muskmelons growing on raised beds between irrigation furrows.

Muskmelon vines require an abundance of moisture when they are making their most vigorous growth and up to the time when the melons are full grown, but great care should be taken to avoid overwatering just before and during the ripening period. Deep rooting and vigorous growth of the vines are possible only if the plants receive enough moisture but the soil does not become too wet. Where furrow irrigation is practiced, as has been stated, muskmelons are grown on raised beds. The vines are kept upon the beds (fig. 6), the furrows remaining open. Short, quick applications of water followed by drainage of the irrigation furrows give the best results. Where it is necessary to irrigate before the plants come up, care should be taken that the water soaks beneath the hills but does not go over their tops.

In some localities normally depending upon natural rainfall during the melon-growing season there are frequent periods during which supplemental irrigation proves to be a decided advantage. The water is applied sometimes by running a small stream in a shallow furrow along the rows, but more often by means of permanent or portable sprinkler irrigation systems. Good judgment of soil conditions and weather prospects is necessary in deciding whether the effect of the water on the growing crop is likely to justify the cost. Irrigation followed by heavy rain often reduces the yield of marketable melons.

INSECT ENEMIES AND THEIR CONTROL [2]

Important insect enemies of the muskmelon include the striped cucumber beetle, the western striped cucumber beetle, the spotted cucumber beetle, the melon aphid, the melonworm, and the pickleworm.[3]

CUCUMBER BEETLES

In most parts of the country east of the Rocky Mountains the striped cucumber beetle is the most important insect enemy of the muskmelon. This insect passes the winter in the adult (beetle) stage, and emerges

[2] This section was prepared by Horatio C. Mason, entomologist, Division of Truck Crop and Garden Insect Investigations, Bureau of Entomology and Plant Quarantine, Agricultural Research Administration. For additional information regarding insects attacking muskmelons, the grower is advised to communicate with his State agricultural college or with the Bureau of Entomology and Plant Quarantine, United States Department of Agriculture, Washington 25, D. C. If he does not recognize the insects causing the injury he should send specimens for identification, together with an explanatory letter. The specimens should be placed in a vial of preservative, such as formalin, and this should be wrapped carefully in a durable container to avoid loss or breakage in transit.

[3] The full names of the insects mentioned here and later are as follows:

Common name	*Scientific name*
Striped cucumber beetle	*Acalymma vittata* (F.)
Spotted cucumber beetle	*Diabrotica undecimpunctata howardi Barber*
Western striped cucumber beetle.	*Acalymma trivittata* (Mann.)
Melon aphid	*Aphis gossypii* Glov.
Melonworm	*Diaphania hyalinata* (L.)
Pickleworm	*Diaphania nitidalis* (Stoll)
Banded cucumber beetle	*Diabrotica balteata* Lec.
Western spotted cucumber beetle.	*Diabrotica undecimpunctata* Mann.

from hibernation in the spring early enough to be present in large numbers at about the time the melon seedlings are pushing through the ground. The beetle not only destroys small muskmelon seedlings but also feeds on the mature plants throughout the season and spreads the bacteria that cause bacterial wilt on cucurbits. In its immature (larval) stage this insect may cause severe damage by feeding on the roots of the plants. Similarly the western striped cucumber beetle causes injury to muskmelons in the Rocky Mountain and Pacific States. East of the Rocky Mountains the spotted cucumber beetle occasionally feeds on muskmelons, as does its close relative the western spotted cucumber beetle in the West. The banded cucumber beetle injures muskmelons in the South and the Southwest.

To control the striped cucumber beetle, the grower must be on the alert to apply an insecticide when the beetle first appears. A delay of 24 hours may mean the loss of an entire planting. The most critical period is between the time the seedlings come through the ground and the time the plants start to form vines.

Dusts or sprays containing rotenone (a poison derived from powdered roots of the tropical plants derris and cube) or cryolite (sodium fluoaluminate) are recommended for use in many sections of the country for control of cucumber beetles. Muskmelon growers usually find that dusting is more practical than spraying.

A dust should contain 0.75 to 1 percent of rotenone, or from 40 to 50 percent of cryolite. For spraying, one of these three preparations is recommended:

	Pounds per 100 gallons of water
1. Derris or cube root powder containing 5 percent of rotenone	3
2. Derris or cube root powder containing 4 percent of rotenone	4
3. Cryolite	5 or 6

Apply the insecticide directly to the plants as soon as the beetles appear and every few days thereafter as long as necessary to prevent injury. Provide a light, even coating of dust or spray over the entire plant, especially at the point where the stem emerges from the soil. The beetles often congregate and feed at this point and thus cause loss of the seedling crop. Apply the dusts at rates of from 15 to 30 pounds and the sprays at rates of from 75 to 125 gallons per acre, the quantity depending upon the size of the plants.

The fungicides ordinarily applied to muskmelons (these do not include lime-sulfur) may be used together with rotenone dusts or sprays, but fungicides containing lime should not be used with cryolite.

Do not overlook the need of sanitary measures. Destroying old muskmelon vines after the crop is harvested reduces the number of beetles that will develop and spread to other plantings, or go into hibernation in the autumn to begin a new infestation the following season.

MELON APHID

The melon aphid is a small louselike insect, which obtains its food by sucking plant juices. It feeds on the under side of the leaf, and its presence oftentimes is first shown by a slight curling or cupping of leaves. An infestation may start from a small number of winged females that fly to muskmelon plants from any one of several food plants. These females start new colonies and, unless checked, the

aphids spread over entire plants and in time may infest an entire field. In heavy infestations the leaves, after curling, lose color and the affected plants die.

Muskmelon plants should be examined frequently for aphids, so that any infestation may be detected early and insecticides applied before it becomes widespread. The insect is hard to control and, once established in a planting, may destroy the crop.

Dusts or sprays containing nicotine are recommended for control of the melon aphid. Dusts are usually more effective than sprays when the foliage is heavy. A dust should contain from 3 to 4 percent of nicotine. If a spray is preferred, mix 1½ pints of 40-percent nicotine sulfate solution and 2 to 4 pounds of soap in 50 gallons of water, or mix small quantities in the proportions of 1 tablespoonful of nicotine sulfate solution and 2 level tablespoonfuls of soap flakes to 1 gallon of water. If the spray forms drops and does not spread over the leaves, add more soap.

Apply the dust or spray to the under sides of the leaves, so it will hit the aphids. An angle-outlet nozzle on the duster tube or an angle nozzle on the sprayer aids greatly in doing this. Best results are obtained when the foliage is dry, when there is little air movement, and when the air temperature is 70° F. or above. Begin treatment as soon as the aphids are seen. Make two or three applications at 4- or 5-day intervals to prevent the aphid infestation from building up. Apply 15 to 35 pounds of dust or 75 to 125 gallons of spray per acre, the amount depending upon the growth stage of the crop.

As nicotine dust deteriorates rather rapidly upon exposure to air, it should be kept in an airtight container. Any portion remaining unused in the duster should be transferred to a screw-top or friction-top can.

When working with nicotine sprays or dusts, avoid inhaling the nicotine fumes. Keep nicotine supplies away from children, animals, and poultry.

The fungicides ordinarily applied to muskmelons may be used together with nicotine dusts or sprays.

PICKLEWORM AND MELONWORM

In certain areas the pickleworm does serious injury to muskmelons, and at times the closely related melonworm does so. Late plantings are usually injured more severely than early plantings. The pickleworm larvae are white with numerous dark spots when young, and pale green when full grown. The melonworm is greenish yellow with two white lines down the back. The melonworm feeds more extensively on the foliage than does the pickleworm, and is therefore more easily controlled with insecticides.

The North Carolina Agricultural Experiment Station recommends cryolite dust for control of the pickleworm. Use it either undiluted or mixed with equal parts by weight of pyrophyllite or talc. According to the Alabama Agricultural Experiment Station, the pickleworm can be controlled fairly well with a derris-talc dust containing 1 percent of rotenone.

Examine muskmelon plants frequently, especially the blossoms and young growing tips. Begin dusting as soon as possible after the first worm is found, and repeat at 5-day intervals as long as protection from these pests is needed. In case of heavy rain within 24 hours

after dusting, repeat the operation as soon as weather permits. Apply the dust at a rate of about 20 to 40 pounds per acre, depending upon the size of the plants and whether you dust the entire plant or just the growing tips. Best results have been obtained by dusting the growing tips. Apply the dust when the air is calm in order to obtain uniform coverage.

DUSTING EQUIPMENT

The home gardener may use a small hand duster of the plunger type. For larger plantings, a knapsack duster of the bellows type is more satisfactory. Power equipment may be desirable for large commercial plantings. Regardless of the type of duster used, the nozzles should be held or adjusted so as to permit the dust to spread before hitting the plants.

DISEASES AND THEIR CONTROL [4]

Anyone growing muskmelons, in any region, must guard against diseases that might seriously damage his crop or even destroy it. The diseases most commonly causing losses of muskmelons are damping-off, downy mildew, anthracnose, powdery mildew, mosaic, alternaria leaf blight, bacterial wilt, fusarium wilt, and root knot. Losses of muskmelons from disease can be prevented or greatly reduced by treating the seed with chemicals, planting it on clean soil, and spraying or dusting the plants. Characteristics of the nine diseases named are given here, and methods are outlined for controlling the diseases.

Chemicals used as fungicides and soil fumigants are injurious to man or animals if taken internally; some of them are very poisonous. Anyone using them should be careful to keep them from getting into his mouth, eyes, or nose. When chemicals are used in dust form care must be taken to avoid inhaling them. Anyone treating a large quantity of seed with a dust should wear a respirator or dust mask. This warning applies also to the dusting of plants in the field. No respirator or mask is needed in treating small quantities of seed in the open air or in a well-ventilated room. When a chemical solution is applied as a spray, any part of it remaining unused should be poured out in such a way that it will sink into the ground and not stand in puddles. All vessels used in preparing a spray solution should be thoroughly cleaned afterward, and all containers of chemicals should be plainly labeled and kept under lock and key or, at least, out of the reach of children.

[4] Certain chemicals used for control of muskmelon diseases are referred to in this bulletin by recently coined common names, as follows:

Common name	*Chemical name*
Ferbam	Ferric dimethyl dithiocarbamate.
Ziram	Zinc dimethyl dithiocarbamate.
Nabam	Disodium ethylene bisdithiocarbamate.
Zineb	Zinc ethylene bisdithiocarbamate.
Thiram	Tetramethylthiuram disulfide.

These chemicals are marketed under various trade names such as Fermate and Karbam–Black for products containing ferbam; Zerlate and Karbam–White for those containing ziram; Dithane D–14 and Liquid Parzate for those containing nabam; Dithane Z–78 and Parzate for those containing zineb; and Arasan for those containing thiram. (Use of trade names in this publication is solely for the purpose of providing specific information. It does not constitute a guarantee or warranty of the products named and does not signify that these products are approved to the exclusion of others of suitable composition.)

DAMPING-OFF

The disease of muskmelon seedlings called damping-off is caused by various fungi, most commonly by *Rhizoctonia solani* Kuehn and species of *Pythium*. These fungi may be present in any agricultural soil. Usually they cause most serious losses during long periods of wet weather. The most common type of damping-off is a shriveling of the stem at the ground line that leads to quick collapse and death of the seedling. The fungi that cause this also cause seed to decay in the ground or kill seedlings before they emerge from the soil. Often when a farmer gets a poor stand of muskmelons and thinks that the seed he planted must have been inferior, these pre-emergence forms of damping-off are the real cause of the trouble.

Damping-off of muskmelon plants usually can be prevented by dusting the seed with certain fungicidal chemicals. These chemicals include among others cuprous oxide, thiram (Arasan), hydroxymercurichlorophenol (Semesan), and tetrachloro-para-benzoquinone (Spergon). Cuprous oxide is used at the rate of 1 percent by weight of seed (1 level teaspoonful per pound of seed). The other materials are used at the rate of 0.4 percent by weight of seed, or ⅓ to ½ level teaspoonful per pound of seed. Seed is poured into a dust-tight jar or other container until the container is a little less than half full, the dust is added, and the container is covered tightly and shaken for 1 to 2 minutes. Excess dust is then screened off and the seed is ready to plant.

DOWNY MILDEW

Downy mildew is one of the most common and most destructive diseases of muskmelons and cucumbers in the Atlantic and Gulf Coast States. At times it causes some damage to watermelons, squash, and pumpkins. It has been reported in most of the States where these crops are commonly grown but is usually not very important in regions other than those mentioned.

This disease, which is caused by the fungus *Pseudoperonospora cubensis* (Berk. & Curt.) Rostoew., usually appears when the vines are beginning to set fruit and spreads very rapidly in warm, moist weather. The first symptoms are small yellowish spots, not sharply outlined, on the leaves. Leaf tissue at the center of each spot soon turns brown and dies (fig. 7). The yellowed area enlarges until it is of considerable size. When the spots become numerous the leaf shrivels and dies. The withered leaves curl upward at the edges; this is a characteristic by which downy mildew can be identified. The oldest leaves die first, and finally only the young leaves at the tips of the runners remain alive. Fruits are not attacked, but those ripening on vines that have lost many leaves are flat and of very poor flavor.

The fungus causing downy mildew produces spores on the under sides of leaves during moist weather. These spores are spread to other leaves by rain and by handling of the plants and also can be carried considerable distances by wind. Periods of hot, dry weather tend to check the spread of the fungus, but after it once appears in a field it is likely to spread rather rapidly unless efforts have been made to control it.

The fungus is not carried on the seed and apparently cannot live over winter in the soil. However, in Florida it lives on some of its host plants throughout the year; and, because the fungus spores can

be carried by wind, the disease gradually moves northward during the spring and summer months and by early August it often appears in the North Atlantic States. The United States Department of Agriculture, with the cooperation of the agricultural experiment stations of the States along the Atlantic Seaboard, now maintains a downy mildew warning service. The Department receives weekly reports on outbreaks and spread of the disease and issues summarized reports that make it possible for State officials to tell growers when the disease seems likely to appear in their localities. Application of fungicides should begin whenever infection threatens and should be repeated at intervals of 7 days through the harvest period if rainfall conditions are normal. If long periods of dry weather occur, application every 10 days may be sufficient.

FIGURE 7.—Muskmelon leaf spotted and yellowed by downy mildew.

Downy mildew is not easy to control, but losses from this disease can be greatly reduced by efficient application of sprays or dusts. Copper compounds are very effective against the downy mildew fungus. Bordeaux mixture, however, is likely to cause considerable injury to muskmelon foliage, and the fixed, or neutral, copper sprays are now more generally recommended than bordeaux mixture when a copper fungicide is to be used. The organic fungicide ziram causes less injury than the copper compounds, particularly on young plants, and appears to be nearly as effective against downy mildew. Spray injury can be reduced by using this compound instead of a copper compound through the fruit-setting period. Another organic compound, zineb, has proved effective and is reported to be less injurious than the copper fungicides. The same is true of a closely related compound, nabam, when it is used with zinc sulfate and lime. These two compounds seem to have given especially good control of downy mildew in the

Southern States. Copper compounds can be used during the latter part of the season without too serious injury to the plants, or a carbamate and a copper fungicide can be used alternately. Methods of applying the fungicides mentioned here are discussed later under the heading "Spraying and Dusting."

Some foreign varieties of muskmelon seem to be resistant to downy mildew, but these varieties generally have little or no commercial value in the United States. The Texas Agricultural Experiment Station has developed one commercially acceptable variety resistant to downy mildew, Texas Resistant No. 1, and research agencies in different regions are working on the development of others.

ANTHRACNOSE

Anthracnose, caused by the fungus *Colletotrichum lagenarium* (Pass.) Ell. & Halst., is a common and damaging leaf spot disease of muskmelons, cucumbers, and watermelons in the Central, Eastern, and Southern States. This fungus attacks leaves, stems, and fruit. On muskmelon leaves the first symptoms are small yellowish, water-soaked spots, irregular in shape, which often occur along the veins of the leaf. These spots enlarge to form reddish-brown dead patches one-fourth to three-eighths inch wide. Often such patches split or are beaten out by rain. This gives the leaves a ragged appearance. On the stems and petioles appear long, dark, sunken spots that may girdle the petioles and young runners. This injury may be severe enough to defoliate the plant within a rather short time. Infected fruits have dark, sharply sunken circular spots about one-half to three-quarters inch in diameter (fig. 8). In warm, moist weather the centers of the

FIGURE 8.—Muskmelon plant affected by anthracnose. The fungus has killed the leaves and spotted the fruit.

spots show pinkish masses of spores. Spores are produced less abundantly on leaves and stems. Spotted fruits are usually unsalable, and fruits from vines with badly spotted foliage are likely to be of poor quality.

The fungus causing anthracnose is carried on the seed and can live for 1 or 2 years in the soil. Seed, probably, is often the source of the first infection that appears in a field. Later, spores produced on diseased plants are splashed to nearby plants by rain, carried by surface drainage water to plants in other parts of the field, and spread also by cultivating or handling plants when they are wet with rain or dew.

To control anthracnose successfully, the muskmelon grower must rotate crops and must disinfect seed. Muskmelons should not be grown in any field where they were grown the preceding year, and no field should be used for growing a cucurbit crop oftener than once in 3 years.

Muskmelon seed for planting should be poured into a bag of loosely woven fabric until the bag is half full, soaked for 5 minutes in a 1–1,000 solution of bichloride of mercury (corrosive sublimate), rinsed for 10 minutes in running water or several changes of water, and then dried. Bichloride of mercury can be bought in the form of blue 7.5-grain tablets. Tablets of this size are convenient for treating small quantities of seed, since one tablet dissolved in a pint of water gives a 1–1,000 solution. In making larger quantities of the solution, 1 ounce of powdered bichloride of mercury is dissolved in 7.5 gallons of hot water. The solution should not be used more than twice; it loses strength with continued use. It must be prepared only in glass, enamel, or earthenware vessels, for the chemical corrodes metal containers. This treatment does not protect against damping-off. If protection against damping-off is desired, the dried seed must be treated as already described.

Bichloride of mercury is a deadly poison. For precautions, see page 18.

Seed treatment and crop rotation alone will not always keep muskmelon plants free from anthracnose. It is advisable, therefore, to protect the plants by spraying or dusting with a fungicide. Until recently the copper fungicides were our only means of controlling anthracnose, but new organic fungicides of the carbamate group have proved more effective against the fungus causing this disease and less injurious to the plants. One of these, ziram, is much less injurious to young plants than the copper compounds and gives good control of anthracnose. Others that effectively control the anthracnose fungus but seem to cause somewhat greater injury to the plants than ziram, especially when the plants are small, are ferbam, zineb, and nabam (the last-named used with zinc sulfate and lime). Where copper fungicides are used for downy mildew control during the latter part of the season, as they frequently are in some of the Northern States, it may be well to set up a schedule calling for alternate applications of a carbamate fungicide and a fixed copper spray after the plants have reached an age of about 4 weeks. Where anthracnose commonly occurs, spraying should begin when the vines have four or five leaves and continue at 7- to 10-day intervals. Methods of applying the fungicides mentioned here are discussed later under the heading "Spraying and Dusting."

Powdery mildew affects muskmelons, cucumbers, squashes, and pumpkins and may occur wherever these crops are grown. It has caused severe losses in the large muskmelon-producing sections in the Southwestern States but is not very important in most other sections where this crop is grown. The disease is caused by the fungus *Erysiphe cichoracearum* DC., of which there are two known races, called race 1 and race 2. These two races produce the same symptoms, but plant varieties resistant to race 1 may not be resistant to race 2.

The first symptoms of the disease are small white patches on the under sides of leaves. These spots may increase in number and size until the older leaves and stems are covered with the white, powdery growth of the fungus (fig. 9). The most severe injury is caused by stem infections, particularly those at the base of the stem. Badly diseased plants are stunted, and their yield is much reduced. Fruits from heavily infected plants tend to ripen prematurely and are often of poor quality.

The best way to prevent muskmelon losses from powdery mildew is to plant resistant varieties. When the disease first became serious in the Southwestern States, race 1 of the fungus predominated there. Varieties resistant to it were produced by the United States Department of Agriculture in cooperation with the California Agricultural Experiment Station. The first and most widely used of such varieties is Powdery Mildew Resistant No. 45, which is similar to Hale Best. After these resistant varieties were developed, losses caused by race 2 of the fungus necessitated further breeding, for resistance to both races. This work has resulted in development of two such varieties, known as Powdery Mildew Resistant No. 5 and No. 6.

Muskmelon varieties resistant to the fungus causing powdery mildew are needed especially because no such satisfactory chemical control has been found for the fungus causing this disease as for others affecting muskmelons. Dusting with sulfur effectively controls it; but sections where the mildew is severe have very high air tempera-

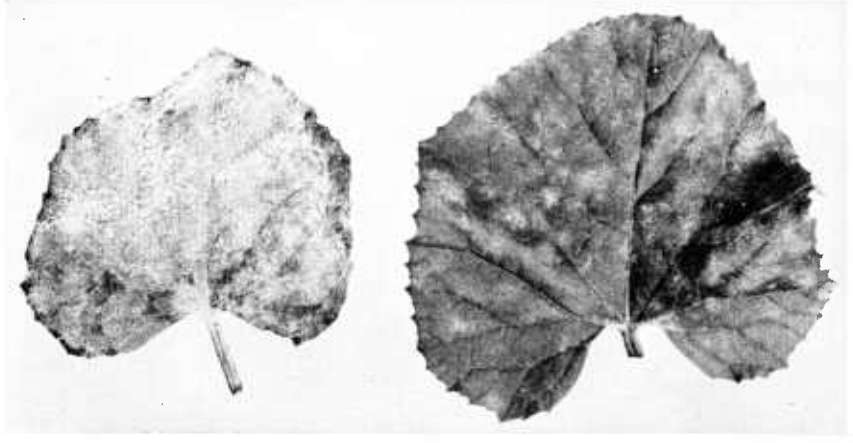

FIGURE 9.—Muskmelon leaves showing grayish-white growth characteristic of powdery mildew.

tures during much of the growing season, and at such temperatures sulfur dust injures most kinds of muskmelon severely. Honey Dew and Honey Ball tolerate sulfur, and recently the varieties V–1 and SR–No. 91 have been specially developed for sulfur resistance. Liquid lime-sulfur (Baumé 32°) used at the rate of 38 ounces (0.3 gallon) to 100 gallons of water is said to give control, but it does damage if used at an air temperature of 95° F. Cuprous oxide can be applied as a spray at high temperatures without very serious injury and in some instances has been reported to have given control of the mildew.

MOSAIC

Mosaic is a widespread and serious virus disease of muskmelons. If even a very small quantity of juice from a plant having this disease is brought into contact with a slight wound in a healthy plant, infection results. The mosaic viruses are spread most commonly by certain species of aphids and are spread also by cucumber beetles. These insects carry the virus from diseased to healthy plants in feeding. The farmer may carry it, too, by handling diseased and then healthy vines. The viruses causing mosaic of muskmelon also attack cucumber and squash, and some strains cause considerable losses on celery, pepper, and certain other vegetables. A number of perennial and annual weeds are often infected with mosaic viruses.

In the Central and Eastern States the most common form of muskmelon mosaic is caused by the ordinary cucumber mosaic virus. Leaves of mosaic-affected muskmelon plants are mottled with light green (fig. 10) and are often somewhat dwarfed and slightly curled, but usually the plants grow to almost normal size. Young fruits are sometimes mottled, and the size and number of fruits are often reduced. Fruits from severely diseased vines are usually of poor quality. This virus is not known to be carried in muskmelon seed and does not live over winter in the soil. It does, however, live over winter in the roots of certain perennial weeds such as milkweed, groundcherry, and catnip, and it is carried in the seed of the common wild cucumber. Aphids feeding on these plants carry the virus to muskmelon fields.

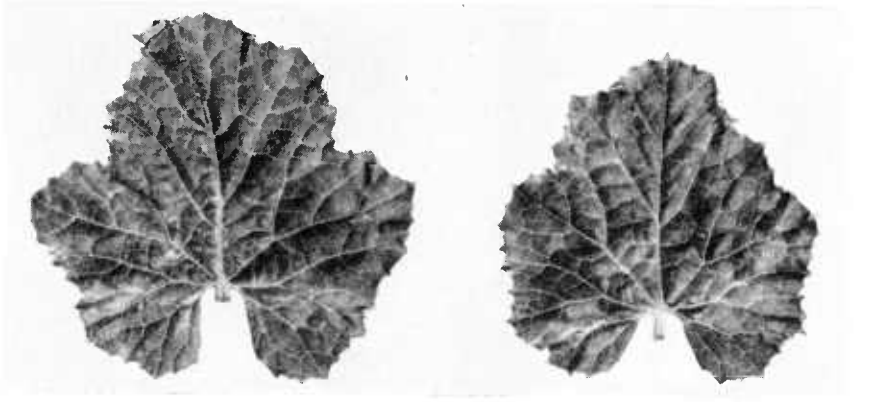

FIGURE 10.—Young leaves of a mosaic-affected muskmelon plant, showing the characteristic mottling with light green.

In recent years mosaic has caused serious losses in muskmelon-growing sections of the Southwest. There the symptoms are similar to those occurring on muskmelons in the Central and Eastern States, but on some varieties they seem to be more severe. Highly susceptible varieties show mottling, deformity, and extreme dwarfing of leaves, although the stems elongate and the plants produce some flowers. The affected plants set few fruits, and the fruits produced are small and of poor quality. Under some conditions, mosaic-affected plants of less susceptible varieties produce a fair crop.

In the Southwestern States the ordinary cucumber mosaic virus is found but the greatest mosaic damage to muskmelons appears to be caused by certain other cucurbit virus strains, which cause very severe injury also to squash. These viruses are carried in a small percentage of the seeds of muskmelon and squash plants affected by them. Squash plants seem to be a common source of primary infection on muskmelons. These viruses are transmitted also in the seed of certain native plants of the cucurbit family. As in other regions, aphids are the chief carriers of the viruses. Certain species of cucumber beetles, also, act as virus carriers, and field workers spread the virus in handling and working with the vines.

The two best measures for controlling muskmelon mosaic are using healthy seed and destroying weed hosts in the vicinity of the field. Insect control is important, but cannot be depended on to prevent mosaic infection. Muskmelons should not be grown close to plantings of other susceptible crops such as cucumber, squash, and peppers. In the Eastern and Central States, destroying perennial weeds near the field has often given good results; in the semiarid sections of the Southwest, control is more difficult. It has been found that fairly satisfactory yields can be obtained from diseased plants if the crop receives careful handling as to irrigation and use of fertilizer. No mosaic-resistant varieties have been made available, but work along this line is in progress.

ALTERNARIA LEAF BLIGHT

Alternaria leaf blight, sometimes known as rust, is a common disease of muskmelons. It is caused by the fungus *Alternaria cucumerina* (Ell. & Ev.) J. A. Elliott (synonym, *Macrosporium cucumerinum* Ell. & Ev.), which also causes a less severe leaf spot of cucumbers, squash, and watermelon. The disease frequently causes considerable losses of muskmelon from defoliation. The first symptoms usually appear in midseason on the older leaves. At first the affected leaves show very small round water-soaked spots. These spots enlarge rapidly, to diameters ranging from ⅛ to ½ inch (fig. 11), and may show concentric ring markings. They gradually turn brown. Often several spots merge, forming a dead area of considerable size. In warm, moist weather the disease spreads rather rapidly and may kill much of the foliage. Fruits of severely diseased vines sometimes show a few small sunken spots.

Losses from this disease can be materially reduced by spraying or dusting with copper fungicides, but such treatment injures young plants. Alternating applications of a carbamate and a copper fungicide used in controlling anthracnose and downy mildew should give

FIGURE 11.—Muskmelon leaf affected with alternaria leaf blight. The spots are brown. Some of them show concentric ring markings.

satisfactory control of the leaf blight. (Methods of applying the fungicides mentioned here are discussed later under the heading "Spraying and Dusting.") Crop rotation is important in preventing outbreaks. The Purdue Agricultural Experiment Station has developed a variety, called Purdue No. 44, that possesses considerable resistance to leaf blight.

BACTERIAL WILT

Bacterial wilt, caused by *Erwinia tracheiphila* (E. F. Sm.) Holland, is a widespread disease of muskmelons, cucumbers, squash, and pumpkins. Sometimes it causes severe losses in individual fields. Infected plants first show a drooping of a few leaves, which remain green. The wilting gradually extends to leaves on other runners. The bacteria cause this wilting by working downward into the water-conducting vessels of the stem and causing them to become clogged. Eventually they kill the plant. The bacteria are spread by the striped and spotted cucumber beetles, which carry them from diseased to healthy leaves on their mouth parts in feeding. The bacteria do not live in the soil or in the seed but are carried over winter by the cucumber beetles.

The most effective means of control consists in using insecticides to reduce the number of beetles in the field. This is especially important during the early part of the season. In small plantings it is recommended that wilted plants be removed and destroyed as an aid in controlling the disease.

Fusarium wilt of muskmelon, caused by the fungus *Fusarium oxysporum* Schlecht. f. *melonis* (Leach & Currence) Snyder & Hansen, has resulted in losses in some sections of the Central and Eastern States. The fungus lives in the soil and enters the plant through the roots. On very young plants grown in badly infested soil it may cause root rot or wilting of the seedling with little external evidence of stem injury. On older plants the first symptom is a wilting of one or more runners (fig. 12). The leaves of the wilting shoots turn brown, and brown dead streaks commonly develop on the stems near the ground line. These streaks may extend some distance, and in moist weather often show salmon-pink masses of the spores of the fungus. Eventually all parts of the plant have wilted, and it withers and dies.

The fungus causing fusarium wilt can live for a long time in the soil. Muskmelons should not be grown on land that is known to be heavily infested with it. Care should be taken to avoid carrying fungus-infested soil to clean fields on cultivators or other farm equipment. Since the fungus enters the plant through roots, spraying will not control the disease. Most of the standard muskmelon varieties are susceptible to wilt, but some wilt-resistant varieties have been developed. The resistant variety Golden Gopher, developed by the Minnesota Agricultural Experiment Station, is adapted to use in any of the North Central States. Another resistant variety is Iroquois, recently developed by the New York (Cornell) Agricultural Experiment Station. Varieties reported to be fairly tolerant of the fusarium wilt fungus are Burrell Gem, Paul Rose, and Pollock 10–25.

FIGURE 12.—Muskmelon plants affected with fusarium wilt. Leaves of wilted shoots are brown and withered, and there are brown streaks at the base of the stem.

Muskmelon losses from downy mildew, anthracnose, and alternaria leaf blight can be much reduced by efficient application of the right fungicides. It must be remembered, however, that fungicides can only protect plants from infection; they cannot cure diseased plants. The three diseases named can be controlled satisfactorily only if spraying or dusting with a suitable fungicide begins before the disease organism has become established and if the spray or dust thoroughly coats the plants.

Sprays stick to foliage better than dusts, but are somewhat harder to apply effectively.

Methods

Power machinery is needed for spraying or dusting a crop that extends over any considerable acreage. Good coverage can be obtained by using spray machines carrying two leads of hose, with which each operator can spray two rows completely or in part, depending on the size of the plants. On sprayers of the potato type, at least four nozzles should be used for each row and six are preferable when the vines become large. The nozzles should be carried close to the ground, particularly those at the side of the row. The sprayer should be operated at a pressure of 250 to 300 pounds, and 75 to 150 gallons of spray per acre should be applied, depending on the size of the plants. Power dusters are available that will give good coverage if the outlets are properly adjusted for the width of row. The amount of dust needed per acre varies from 25 to 50 pounds, depending on the size of the plants. In general, in order to obtain satisfactory coverage and get the dust to stick it is best to dust early in the morning or toward evening, when the air is still and the plants are likely to be wet with dew.

Fungicides ordinarily should be applied to muskmelon plants at intervals of 7 to 10 days. In extended periods of dry weather a 10-day interval probably is not too long, but a 7-day schedule is safest for control of downy mildew during the latter part of the season. Spraying or dusting should begin when the plants are about 12 to 15 inches long and continue through harvest.

Where vines are to be sprayed systematically every week or 10 days, they are trained so that a roadway is kept open every few rows for passage of the sprayer.

Fixed Copper Sprays

The fixed, or neutral, copper compounds include copper oxychloride sulfate, tribasic copper sulfates, copper oxychloride, cuprous oxide, and other preparations. They are generally sold by manufacturers under trade names. These compounds do somewhat less injury to the plant than bordeaux mixture, and for that reason they have tended to replace it in recent years. However, any copper fungicide may cause some yellowing of the edges of muskmelon leaves, especially in dry weather.

The copper content of these preparations varies. It is best to use them on a basis that gives about 1½ pounds of copper (calculated as metallic copper) to 100 gallons of water. The copper content of each preparation is shown on the label, and the amount needed can readily be calculated from this. For example, 3 pounds of a compound containing 50 percent copper would be needed to give 1½ pounds of

copper. A copper spray should not be used on very small plants, as it may injure them very severely. If small plants are to be sprayed, it is best to use one of the organic compounds (carbamates) discussed here.

Fixed Copper Dusts

Fixed coppers for use as dusts can usually be bought from dealers in agricultural supplies. A dust containing 5 to 6 percent actual copper is commonly used. Dusts can be prepared by mixing the necessary amount of the copper compound with talc, pyrophyllite, or some other light, inert ingredient. If the compound contains 50 percent copper, 10 pounds of it and 90 pounds of the inert carrier are mixed to obtain a 5-percent dust.

Bordeaux Mixture

Bordeaux mixture, while an excellent fungicide, is no longer generally recommended for muskmelons, because it is likely to injure the plants. It should never be applied when the plants are very small. In recent years it has been found that reducing the amount of lime used in preparing bordeaux mixture tends to reduce injury to plants. Therefore, for muskmelons, a 6–3–100 mixture is preferable to the older 6–6–100 formula. It is made up of 6 pounds of copper sulfate (bluestone), 3 pounds of hydrated spray lime, and 100 gallons of water. In preparing bordeaux mixture a finely powdered form of copper sulfate can be used that dissolves rapidly in water. The powdered copper sulfate is placed on the screen of the spray tank and dissolved by running in enough water to fill two-thirds of the tank. The solution is then agitated while the lime, in a thin paste, is washed in with enough water to complete filling the tank.

Ziram

Ziram, one of the newer organic fungicides, appears to be superior to the copper compounds in controlling anthracnose. It also appears to be fairly effective in controlling downy mildew, but in this respect may not quite equal the copper fungicides. It is less likely to cause injury to the plants than are the copper compounds. For use as a spray, it is dissolved in water at the rate of 2 pounds of the commercial product to 100 gallons. No lime is used. For use as a dust, it is mixed with a finely divided, light, inert carrier such as talc at the rate of 10 pounds of ziram to 90 pounds of the carrier.

Ferbam

Ferbam has been reported to give good results in control of anthracnose but seems somewhat more injurious to young plants than ziram. It is used as a spray at the rate of 2 pounds of the commercial product to 100 gallons of water and as a dust at the rate of 4 to 8 percent of ferbam in talc or some other light, inert carrier.

Zineb

Zineb is an organic fungicide that has proved effective in control of downy mildew. It is reported to be effective against anthracnose, but seems to be more injurious to young plants than ziram. In preparing it as a spray, 2 pounds of the commercial product is added to 100 gallons of water. In dusting, it is best to use zineb at the rate of 6 to 8 percent in talc or pyrophyllite.

Nabam

Nabam is used in liquid form. In making the spray, 2 quarts of the commercial product is added to 100 gallons of water. To the nabam solution are added first 1 pound of zinc sulfate and then ½ pound of hydrated lime. When this formula is followed the reaction product is closely related to zineb. Nabam with zinc sulfate and lime appears to be effective against downy mildew and also to be valuable in controlling anthracnose, but may be somewhat more injurious to small plants than ziram.

ROOT KNOT [5]

Root knot is caused by minute eelworms, or nematodes (of the *Heterodera marioni* group), which attack the roots of muskmelons and other vegetable crops in many sections of the country, producing root swellings, or galls. Above-ground symptoms are lack of vigor, even dwarfing of the plants, and wilting, particularly during the hot period of the day. This trouble is often very serious in the sandy soils of the South. Whenever possible, the muskmelon grower should use land that is free from root knot nematodes. As a measure for cleaning nematode-infested land to such an extent that it can produce profitable crops of muskmelons, it is recommended that one or more of the following crops be grown on it for 2 or 3 years between muskmelon crops: Small grains, hairy indigo, any of several crotalarias, and (in some localities) peanuts.

Nematodes can be controlled successfully by fumigating the soil. The fumigants most commonly used are mixtures containing dichloropropene (such as D–D, Dowfume N, and Nemafume) and mixtures containing ethylene dibromide (such as Dowfume W–40, Soilfume 60–40, Iscobrome D–42, Bromofume 40, and Iscobrome D). Small quantities of a fumigant are injected into the soil at closely spaced points to a depth of about 6 inches, or a very small continuous stream of the fumigant is played along a furrow at a depth of about 6 inches. A whole field may be fumigated, or the chemicals may be applied only in rows or hills where seed is to be planted. For muskmelons and other crops that are grown in widely spaced rows or hills, application in the row or in the hill has usually given satisfactory control of root knot at substantially less cost than treating the entire area. The various methods may be described as follows:

1. Entire-area fumigating, large-scale, is usually done with power-driven applicators that apply from 6 to 10 parallel streams at the same time. The chisels or other devices that deliver the fumigant into the soil should be spaced 12 inches apart.

2. Entire-area fumigating, small-scale, can be done with hand applicators. The rows of injection points should be 12 inches apart and the injection points should be 12 inches apart in the row. It is important that spacing be fairly accurate. The best way to make it so is to mark the field into 12-inch squares and inject the chemical checkerboard fashion—that is, at the crossmarks in even rows and halfway between the crossmarks in odd rows.

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[5] This section was prepared by J. R. Christie, senior nematologist, and Edna M. Buhrer, associate nematologist, Division of Nematology, Bureau of Plant Industry, Soils, and Agricultural Engineering.

3. In-the-row fumigating, large-scale, is usually done with power applicators equipped to deliver a very small stream of the fumigant in the row where seed is to be planted.

Recently, some growers have been using power applicators that deliver a slightly smaller stream of the fumigant on *each side* of a row where seed is to be planted. The chisels through which the fumigant is fed are spaced 12 inches apart. This method is giving better control than the single-stream method of in-the-row fumigation. Tests are being made to find whether the advantage in results justifies the additional expense.

4. In-the-row fumigating, small-scale, can be done with hand applicators. A single row of injections 12 inches apart is made along each planting row.

5. In-the-hill fumigating is done with hand applicators. The position of each hill is determined and marked, and a single injection is made at each such point.

Soil is prepared for fumigation in the same manner as for seeding. The prepared soil should be moderately loose and reasonably free from clods, lumps, and undecomposed weeds or crop residues, and should have a fairly smooth surface. Roots from the preceding crop should have had time to decay. The temperature of the soil should be 60° F. or above. The soil should be fairly moist at a level close to the surface, for fumigants do not give satisfactory results when applied to dry soil. In other words, the soil should be just moist enough to permit planted seed to germinate easily.

Recommendations as to the quantities of chemicals used in fumigation by the various methods are as follows:

1. In entire-area fumigation: *a.* For a dichloropropene mixture, adjust power applicators to deliver about 25 gallons per acre and hand applicators to deliver about 2.5 cubic centimeters per injection. *b.* For an ethylene dibromide mixture, adjust power applicators to deliver about 15 gallons per acre and hand applicators to deliver about 1.5 cubic centimeters per injection.

2. In in-the-row fumigation, one stream per row: *a.* For a dichloropropene mixture, adjust power applicators to deliver about 3 cubic centimeters per linear foot of row and hand applicators to deliver about 3 cubic centimeters per injection. At these rates 1 gallon will treat about 1,300 feet of row. *b.* For an ethylene dibromide mixture, adjust power applicators to deliver about 2 cubic centimeters per linear foot of row and hand applicators to deliver about 2 cubic centimeters per injection. At these rates 1 gallon will treat about 1,900 feet of row.

In in-the-row fumigation, one stream on each side of a row: *a.* For a dichloropropene mixture, adjust the two shanks of the power applicator to deliver a total of 4.5 cubic centimeters (that is, 2.25 cubic centimeters per shank) per linear foot. *b.* For an ethylene dibromide mixture, adjust the two shanks of the power applicator to deliver a total of 3 cubic centimeters (that is, 1.5 cubic centimeters per shank) per linear foot.

3. In in-the-hill fumigation: For either a dichloropropene or an ethylene dibromide mixture, adjust hand applicators to deliver about 3 cubic centimeters per injection.

The rates suggested above for ethylene dibromide apply to mixtures containing about 40 percent of this chemical by weight (such as Dowfume W–40, Soilfume 60–40, Iscobrome D–42, and Bromofume 40).

For mixtures containing lesser amounts of ethylene dibromide the rates should be increased proportionally; for example, for mixtures containing 20 percent ethylene dibromide by weight, such as Iscobrome D, the above rates should be doubled.

Holes or furrows left by the applicator should be filled promptly and firmly—merely knocking a little loose dry soil into them is not sufficient—and the soil surface should be left smooth and compact. When power equipment is used the soil surface can usually be smoothed satisfactorily with a drag attached behind the applicator. When it is necessary to drag or roll an area as a separate operation, this should be done promptly.

The time that must elapse between applying the fumigant and planting the seed varies greatly, depending on the fumigant used, the rate of application, and the moisture content and temperature of the soil. If fumigants are applied at the rates recommended, the temperature of the soil is not below 70° F., and the moisture content of the soil is only moderate, the following intervals should be sufficient: For dichloropropene mixtures, 18 days; for ethylene dibromide mixtures, 10 to 14 days. The drier the soil and the higher its temperature, the quicker the gases escape. Fumigants linger in cool, wet soil.

Where in-the-row or in-the-hill fumigation is practiced, care must be taken to plant the seed *exactly* along each treated row or near the center of each treated hill.

Several types of hand applicators are on the market. Large-scale operations requiring power-driven equipment often are carried out on a custom basis by individuals or companies engaging in the business of applying fumigants and owning the necessary equipment.

Anyone handling a soil fumigant should observe these precautions: Avoid prolonged breathing of the fumes. Never, under any circumstances, risk getting the liquid into the eyes or mouth. Do not allow the liquid to remain in contact with the skin; wash it off promptly with soap and water. If the liquid is spilled on shoes, gloves, or other clothing, remove the garments without delay.

GATHERING AND HANDLING

Successful marketing of muskmelons depends largely upon careful gathering and handling. Where the plants are grown in long rows and large blocks, the vines of about every tenth row should be laid carefully together (fig. 13) when ripening begins, to clear roadways for use in hauling away the crop. Where field roads at right angles to the rows have been provided, the pickers work toward these roads and deposit the melons at the roadsides to be picked up by trucks or trailers.

Many of the muskmelons shipped to the principal markets of the United States are picked too green, and marketing of unripe melons has injured later sales. The experience of efficient growers and dealers, and the results of experiments made by the Department of Agriculture, show that muskmelons do not attain their finest flavor and best eating qualities unless they become fairly ripe on vigorous, disease-free vines.

Western growers usually group muskmelons into three classes as to maturity. These are, in ascending order of ripeness, "fancy," "hard ripe," and "choice." The best melon for eastern shipment is the hard ripe. This melon is "full slip"—that is, its entire stem separates from

FIGURE 13.—When muskmelons begin to ripen, roadways to be used in hauling them away are cleared by laying vines together.

the melon under slight pressure, leaving a clean stem scar (fig. 14); but it is still firm and yellow green. Hard-ripe melons need prompt and adequate refrigeration if they are to be shipped distances requiring more than 2 or 3 days. Choice melons are full slip and yellowish. At transit temperatures of 40° F. or less, which are now provided by top icing, they can be shipped from California to eastern markets. Fancy melons, the least mature class harvested in the West, are half to full slip, greenish, and hard. (In the condition known as half slip, illustrated in figure 15, about half the stem remains attached to the melon when the other part has separated from it under pressure.) Picking of melons at this stage of maturity is not advisable.

Experienced pickers soon learn to recognize the stage of ripeness of melons by their general appearance—mainly by the color of the background—and after one or two pickings are able to judge it accurately at a glance.

The conditions known as half slip and full slip indicate ripeness accurately only for melons of the netted type that are borne on healthy plants under favorable weather conditions. In many cases, particularly in the Eastern States, rainy weather, disease, insect infestation, and other factors cause melons to separate from the vines when they are still unripe and inedible.

It is desirable that muskmelons ripen on the vines to the greatest degree consistent with the method of handling; but there is always danger of overstocking the markets with soft melons—particularly near the end of the picking season. The vines should be gone over about every other day for the first week of the picking season and every day of the second week. The first melons mature slowly, and as the season advances the ripening becomes more rapid. Toward

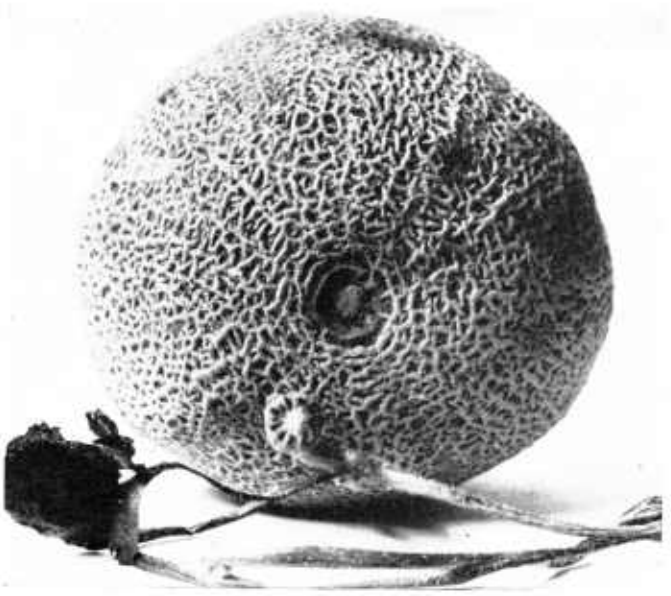

FIGURE 14.—Muskmelon picked at the full-slip stage of maturity. Note that the stem has pulled away from the melon, leaving a clean, cuplike hole.

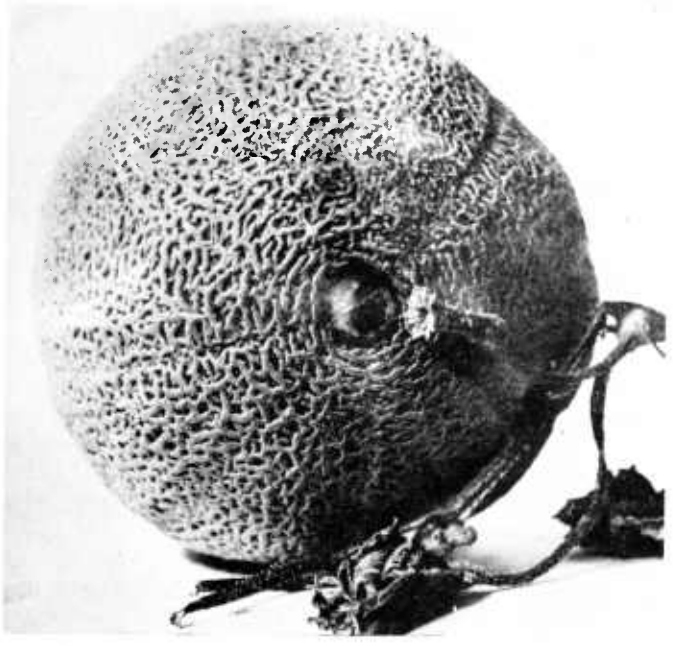

FIGURE 15.—Muskmelon picked at the half-slip stage. At the right the stem has slipped from the melon easily, leaving a depression. The other part of the stem, however, has broken. As a rule, this condition signifies a less degree of ripeness than the full slip.

the end of the season, the oftener the vines are gone over and suitably ripe melons are gathered the better.

The right way to remove a muskmelon from the vine is to press on the stem with the thumb, or slightly lift the melon from the ground. If the melon is ripe enough to be picked the stem will separate from the fruit.

Hampers, baskets, crates, and other types of container are used for gathering muskmelons. As a rule the melons are hauled to the packing shed in the picking containers. A very large part of the crop is gathered into canvas sacks holding about a crate of melons each. These sacks are carried on the backs of the workmen and are emptied directly into padded trailers and trucks on nearby roadways or straddling the field rows. The trailers may be 6 to 8 feet wide and as much as 15 feet long. When loaded, they are usually hauled directly into the packing house. Melons gathered in sacks are more likely to be bruised than those gathered in baskets or crates. Often no picking containers are used, the melons being merely laid in piles. Where this has been done, men on the ground toss the melons to men on the truck, who place them in bulk in the truck or trailer. This kind of handling is likely to lead to damage. Muskmelons should not be handled roughly and are preferably gathered in baskets or crates.

After the melons are gathered no time should be lost in removing them to the packing shed. Exposure to the heat of the sun in the field is likely to cause them to soften very rapidly. A load that is to be hauled a considerable distance should be protected from the sun with a canvas cover.

GRADING AND PACKING

The old-time temporary packing shed constructed in the muskmelon field of boards or of poles and tree branches has very largely been replaced by the permanent central packing shed or house, serving a large number of farms. A central shed or house is usually located on a railway siding, so that the melons graded and packed in it can be loaded directly into refrigerator cars. Melons collected at a central point, from large acreages, can be graded and packed more uniformly than they could be in the field. A saving results, also, from not having to haul the shipping crates to the farm and back again. At a central shed where the workers have been well trained and a capable superintendent is in charge, as a rule the packing can be done at lower cost than on the farms.

In modern packing houses, muskmelons are unloaded from the padded trucks or trailers directly onto conveyor belts, which carry them past sorters who throw out the culls. The melons then may pass through a waxer, which coats them with wax dissolved in a petroleum-ether solvent. Next they pass along a belt where they are classified on the basis of maturity, in accordance with the distance to the markets to be supplied. In the West, where a very large part of the commercial muskmelon crop is produced, the yellowish ripe melons, good for local markets, are commonly graded as "local choice," and melons that are full slip but not too ripe to stand a trip to distant markets if well precooled and refrigerated are graded as "terminal quality."

The sorters who classify the melons as to maturity place them in bins. The packers work from these bins, each doing his own sizing.

As the crates are packed they are placed on a conveyor and carried to the lidder or the lidding machine. The number of melons is stamped on each crate. When the crates are removed from the conveyor they are grouped according to melon size and maturity, so that carlots can easily be made up for markets at greater or less distance.

The efficiency of melon packing depends largely upon how equipment is arranged and how working forces are organized. Melons from trucks and trailers arriving at a packing shed should be unloaded as near as possible to the grading tables. Usually the graders work on the side of the table where the melons are received from the trucks, the packers work on the carloading side, and the packed crates are shifted from the packing table to low benches, where the covers are nailed on. The labor should be apportioned in such a way that all hands are kept busy and the melons are kept moving steadily toward the refrigerator car from the time they are received.

Muskmelon growers of California, Colorado, and Arizona commonly ship their product in jumbo crates 13 by 13 by 22⅛ inches. Often they pack the larger melons in jumbo flat crates 5 inches deep, 14½ inches wide, and 22⅛ inches long. In these States the standard muskmelon crate is 12 by 12 by 22⅛ inches, pony crates are as a rule 11 by 11 by 22⅛ inches, and flats are 4 by 12 by 22⅛ inches or 4½ by 13½ by 22⅛ inches, inside measurement. Eastern growers have not adopted any standard crate dimensions and use crates varying considerably from these measurements. Crates used in the West usually are of post-and-rail construction and have sawed slats; those used in the East have paneled ends and either sawed or veneer slats.

The large markets of the United States have come to recognize a pack consisting of 45 muskmelons in the standard 12- by 12- by 22⅛-inch crate (fig. 16). To make this pack it is necessary that the melons be 4 but not more than 4½ inches in diameter and 4 to 4½ inches in length. This pack has a depth of 3 layers, each layer containing 3 rows of 5 melons each, the melons being placed end to end and completely filling the length of the crate. Slightly larger melons are often packed 36 to the standard crate. Extra-large melons (over 5

FIGURE 16.—The standard muskmelon pack—45 melons in a standard 12- by 12- by 22⅛-inch crate.

inches in diameter) are usually packed in jumbo crates. The jumbo pack consists of 36, 33, 27, or 24 melons, according to melon size, and the arrangement varies according to the size and shape of the individual melons. In many sections the pony crate is not used but small melons are packed 54 to 60 to the standard crate and those so small that 60 would not fill a crate are, as a rule, discarded. Flat crates are packed with 9, 12, or 15 melons to a crate, according to the size of the individual melons (fig. 17).

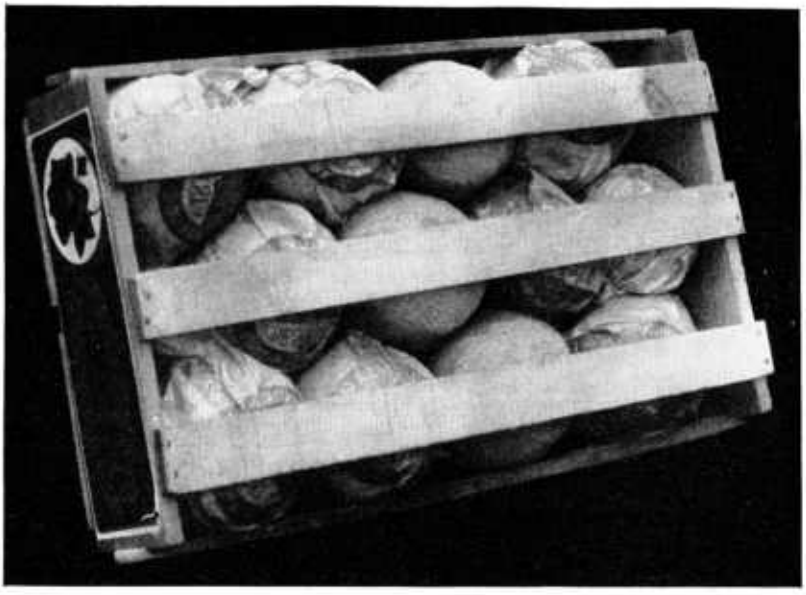

FIGURE 17.—Standard flat crate holding 9 to 15 muskmelons.

Growers in Maryland and Delaware use crates 12 by 12, 13 by 13, or 14 by 14 inches with slats 22 to 26 inches long, usually packing 36 melons to a crate. They also use two-third crates 10 by 15 and 9½ by 14 inches (packing 24 melons to a crate) and 5- by 15-inch, 5½- by 16½-inch, and 6- by 18-inch crates with slats 22 to 30 inches long (usually packing 12 melons to a crate). The tub bushel basket is used in Maryland and Delaware.

North and South Carolina growers use standard crates 12 by 12 by 22 inches, two-third crates 8 by 12 by 22 inches, and also bushel baskets.

In all cases the pack should be snug and the package so full that it has a slight bulge to allow for shrinkage in transit. Melons that are slack packed shift about during handling and are likely to become bruised, with the result that they fail to bring full price when they reach the market. The crates should be loaded into refrigerator cars or upon a truck as rapidly as they are packed and should be sent to market in the shortest possible time. When the packing is done under field shelters the melons should be protected from the sun at all times, especially after they are graded and packed in the shipping crates.

Muskmelons that are well-netted, clean, and smooth and are packed in neat, attractive crates present the best possible appearance on the

market. Wrapping the individual melons in tissue paper before packing them in crates for shipment gives the package an attractive appearance but is not advisable, as the paper interferes with the cooling of melons in a refrigerator car and often causes them to mold in transit. Well-designed colored labels on the ends of the crates add materially to the appearance of the package. The color work on these labels should not be overdone, and the label should not misrepresent the contents of the crate as to variety, grade, or locality where grown. In a few shipping sections it is common practice to place a small paper sticker on each melon. This is good advertising but involves considerable extra labor; besides, every additional time the individual melons are handled increases their liability to injury.

Rough handling must be avoided all along the line.

LOCAL MARKETING

Increase in automobile travel has created an excellent opportunity for local production and sale of muskmelons. By means of truck transportation, markets up to several hundred miles from the point of origin can be supplied with vine-ripened melons of high quality. A well-located, well-managed roadside market soon gains a patronage that takes care of a considerable acreage of melons. Often a market is established temporarily on a main-traveled highway for the sole purpose of handling a muskmelon crop. Often, also, at a roadside market that is more or less permanent and offers other farm products the melons can be made special during their season. One melon grower follows the practice of leasing acreage suitable for muskmelon production within a mile of a central point on the main highway where he can establish his market during the period when the melons will be ready for sale. This grower plants only on land that has not been in melons for a number of years (usually, on land in bluegrass or clover sod), sprays regularly, and produces high-class melons. He hauls the melons from the fields to the market in small motor trucks. There he grades them according to size and freedom from defect and displays them in bins that face the roadway. Many of his best customers drive from the nearby city primarily to get a supply of fine-quality melons, and they usually buy considerable quantities, including melons that are fully ripe and some that will keep for 3 or 4 days. Usually the customers bring baskets with them. The dealer keeps a few bushel baskets and hampers on hand for sale, but otherwise does not provide any containers.

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